IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-12 (Canceled)

13. (Currently Amended) A method for controlling the operation of a compressor, in which the compressor is switched off by a control unit to avoid thermal damage if ~~an estimated~~ a compressor temperature value (Ts(Tc)) calculated by said unit exceeds an upper threshold value (T_{max}), or remains switched on or is switched on if there is a compression requirement and if a lower threshold value (T_{min}) is not reached, comprising the steps of:

storing a mathematical-physical model in memory of the control unit wherein the mathematical-physical model characterizes cooling and heating properties of the compressor; and

~~determining~~ calculating a ~~the estimated~~ temperature value (Ts(Tc)) of the compressor indirectly and cyclically by means of the mathematical-physical model by

determining physical-technical influencing variables (U), which influence the estimated temperature (Ts(Tc)) in a changing manner,

determining, with the aid of the influencing variables (U),at least one relative temperature (Tc_1; Tc_2), which describes the thermal state of the compressor,

adding or subtracting, for this purpose, the currently applicable influencing variables (U) from the cyclically prior value of the relative temperature (Tc_1, Tc_2), so that a currently applicable relative temperature (Tc_1; Tc_2) is obtained as the result of this calculation,

determining a currently applicable estimated temperature (Ts(Tc)), taking into account the heating and cooling behavior of the compressor, from this currently applicable relative temperature (Tc_1; Tc_2) and the ambient temperature ($T\infty$) of the

compressor, and then

using this cyclically ~~determined estimated~~ calculated temperature (Ts(Tc)) for carrying out a limit value comparison with a lower temperature threshold value (T_{min}) and an upper temperature threshold value (T_{max}), on the basis of which the operation of the compressor is controlled,

wherein the influencing variables (U) are entered in a heating function (B(U)), which describes the heating behavior of a specific compressor.

14. (Canceled)

15. (Previously Presented) The method as claimed in claim 13,

wherein, apart from other variables, the influencing variables (U) include at least one of the following quantities:

the electric voltage (U_{comp}) at the compressor, the counterpressure (P) of the compression medium downstream of the compressor and, in the case of closed pressure systems, the admission pressure of the pressure medium at the inlet of the compressor.

16. (Canceled)

17. (Previously Presented) The method as claimed in claim 13,

wherein the influencing variable (A(Tc)) represents a cooling function which takes into account the cooling properties of a specific compressor and the surroundings in which it is installed.

18. (Previously Presented) The method as claimed in claim 17,

wherein, to calculate a current value of the relative temperatures ($Tc_{1,i}$; $Tc_{2,i}$), the value of the cooling function (A(Tc)) is subtracted from the last predetermined or calculated values of the relative temperatures ($Tc_{1,i-1}$; $Tc_{2,i-1}$) if the compressor is not in operation or is in operation in the time interval considered, and the value of a heating function B(U) is added if the compressor is in operation in the time interval considered.

19. (Currently amended) The method as claimed in claim 13,

wherein the relative temperature (Tc_1; Tc_2) and the ~~estimated~~ calculated temperature (Ts(Tc)) for a time increment (i) are calculated according to the following equations:

with the compressor switched off

$$Tc_i = Tc_{i-1} - A\,Tc_{i-1}$$

and with the compressor switched on

$$Tc_i = Tc_{i-1} - A\,Tc_{i-1} + B\,U_i$$

and for the estimated temperature

$$Ts_i = C\,Tc_i + T\infty$$

in which the values A to C represent matrices with constant coefficients which characterize the compressor and the compressor surroundings, in particular with regard to their thermal properties.

20. (Currently amended) The method as claimed in claim 13,

wherein the initial value of the relative temperature (Tc) is chosen such that the ~~estimated~~ calculated temperature (Ts(Tc)) of the compressor corresponds to the value of the ambient temperature (T∞) at the installation location of the compressor.

21. (Previously Presented) The method as claimed in claim 20,

wherein the initial value of the relative temperature (Tc) is set to the value zero at the beginning of the compressor control method.

22. (Currently amended) The method as claimed in claim 13, comprising the following steps:

a) establishing the operating state of the compressor (on or off),

b) measuring at least one on the two following pressure values: the counterpressure P of the pressure medium downstream of the compressor and, in the case of closed systems, the admission pressure upstream of the compressor,

c) measuring the currently applicable operating voltage U_{comp} of the compressor,

d) measuring or estimating the ambient temperature $T\infty$ of the compressor,

e) determining the validity of the influencing variables, operating voltage U_{comp} and counterpressure P or the compressor inlet pressure (admission pressure),

f) calculating the current value of the heating function B(U) by using heating-specific influencing variables U,

g) calculating the current value of the cooling function A(Tc) by using the characteristic temperatures of the last time clock,

h) calculating the characteristic relative temperatures Tc_1; Tc_2 by addition and/or subtraction of the current values of the heating function B(U) and the cooling function A(Tc),

i) calculating the ~~estimated~~ calculated temperature Ts(Tc) as a function of the characteristic relative temperatures Tc_1; Tc_2 and the ambient temperature $T\infty$,

j) comparison of the ~~estimated~~ calculated temperature Ts(Tc) with predetermined temperature threshold values T_{min} and T_{max}, where T_{min} is less than T_{max},

k) clearance for starting the compressor if the ~~estimated~~ calculated temperature Ts(Tc) is less than or equal to T_{min}, or authorization to continue operation if the estimated temperature Ts(Tc) is less than the temperature value T_{max},

l) switching off the compressor if the ~~estimated~~ calculated temperature Ts(Tc) is greater than or equal to the temperature value T_{max},

m) storing the characteristic relative temperatures Tc_1; Tc_2 for use in the next calculation run,

n) waiting until the next time clock, and

o) starting the next calculation run (step a).

23. (Previously Presented) The method as claimed in claim 22,

wherein the validity of the measured variables, operating voltage U_{comp} and counterpressure P or admission pressure, is determined by these values being multiplied by the value "one" if the compressor is in operation or multiplied by the value "zero" if the compressor is not in operation.

24. (Currently Amended) The method as claimed in claim 13,

wherein, even if the ~~estimated~~ calculated temperature (Ts(Tc)) is greater than the temperature threshold value (T_{min}), the compressor may be switched on if the operating time of the compressor, until the upper threshold value (T_{max}) is reached, is sufficient to convey an amount of pressure medium adequate for a specific application.